

WHAT IS CLAIMED IS:

1. A tracking error detection device for an optical disk apparatus, the device comprising: /

5 a detecting unit which includes at least two detectors and detects a reflected light from a series of pits formed on an optical disk;

a phase comparing unit which detects a phase difference of outputs of the at least two detectors; and

10 a low-pass filter which smoothes an output of the phase comparing unit, a cut-off frequency of the low-pass filter being higher than a frequency at which a spectrum of a modulation code recorded in the optical disk becomes -10dB and lower than a frequency at which
15 the spectrum of the modulation code recorded in the optical disk becomes -5dB.

2. A tracking error detection device according to claim 1, wherein the cut-off frequency of the low-pass filter is at least 8 times of a frequency band of
20 tracking servo control of the optical disk apparatus.

3. A tracking error detection device for an optical disk apparatus, the device comprising: /

25 a detecting unit which includes at least two detectors and detects a reflected light from a series of pits formed on an optical disk;

a phase comparing unit which detects a phase difference of outputs of the at least two detectors;

and

a low-pass filter which smoothes an output of the phase comparing unit, a cut-off frequency of the low-pass filter being higher than 40 KHz and lower than 50 KHz.

4. A tracking error detection device for an optical disk apparatus, the device comprising:

a detecting unit which includes four detectors diagonally arranged relative to a center of a pit formed on an optical disk and detects a reflected light from a series of pits formed on the optical disk;

an adder which adds two outputs of two sets of two detectors diagonally arranged and outputting a first detection signal and a second detection signal;

an equalizer which equalizes a waveform of the first detection signal and the second detection signal in order to compensate high-frequency components of the first and second detection signals;

a binarizing unit which binarizes equalized first and second detection signals;

a phase difference detecting unit which detects a phase difference of binarized first and second detection signals; and

a low-pass filter which smoothes an output of the phase difference detecting unit, a cut-off frequency of the low-pass filter being higher than a frequency at which a spectrum of a modulation code recorded in the

optical disk becomes -10dB and lower than a frequency at which a spectrum of the modulation code recorded in the optical disk becomes -5dB.

5 5. A tracking error detection device according to claim 4, wherein the cut-off frequency of the low-pass filter is at least 8 times of a frequency band of tracking servo control of the optical disk apparatus.

6. A tracking error detection method for an optical disk apparatus, the method comprising:
10 detecting a reflected light from a series of pits formed on an optical disk by using at least two detectors;

 detecting a phase difference of outputs of the at least two detectors; and

15 smoothing the detected phase difference by using a low-pass filter of which cut-off frequency is higher than a frequency at which a spectrum of a modulation code recorded in the optical disk becomes -10dB and lower than a frequency at which the spectrum of the modulation code recorded in the optical disk becomes
20 -5dB.

7. A tracking error detection method according to claim 6, wherein the cut-off frequency of the low-pass filter is at least 8 times of a frequency band of tracking servo control of the optical disk apparatus.
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8. A tracking error detection method for an optical disk apparatus, the method comprising:

detecting a reflected light from a series of pits
formed on an optical disk by using at least two
detectors;

5 detecting a phase difference of outputs of the at
least two detectors; and

smoothing the detected phase difference by using a
low-pass filter of which cut-off frequency is higher
than 40 KHz and lower than 50 KHz.

9. A tracking error detection method for an
10 optical disk apparatus, the method comprising:

detecting a reflected light from a series of pits
formed on an optical disk unit by using four detectors
which diagonally arranged relative to a center of a pit
formed on the optical disk;

15 adding two outputs of two sets of two detectors
diagonally arranged and outputting a first detection
signal and a second detection signal;

equalizing a waveform of the first detection
signal and the second detection signal in order to
20 compensate high-frequency components of the first and
second detection signals;

binarizing the equalized first and second
detection signals;

25 detecting a phase difference of the binarized
first and second detection signals; and

smoothing the detected phase difference by using a
low-pass filter of which cut-off frequency is higher

than a frequency at which a spectrum of a modulation
code recorded in the optical disk becomes -10dB and
lower than a frequency at which a spectrum of the
modulation code recorded in the optical disk becomes
5 -5dB.

10. A tracking error detection method according to
claim 9, wherein the cut-off frequency of the low-pass
filter is at least 8 times of a frequency band of
tracking servo control of the optical disk apparatus.